

[0024] Advantageously, the surface of the second material supporting substrate comprising the first material layer and/or the bonding surface of the receiving substrate further comprise(s) a Bragg mirror consisting of an alternation of thin films with different refraction indices n_1 and n_2 .

[0025] According to a specific embodiment, the step of partially removing the initial substrate is performed by implanting, prior to the bonding step, gaseous species in the second material supporting substrate, and by performing thermal annealing of the bonded implanted structure obtained, at a temperature below the evaporation temperature of the second material and/or by applying mechanical stresses to the bonded implanted structure. This results in the supporting substrate, which can be recycled, having a thin film been taken from it, and the receiving substrate onto which the thin film taken from the supporting substrate, as well as the first material layer, are transferred.

[0026] The gaseous species used for the implantation are advantageously H or He ions, noble gases.

[0027] According to another specific embodiment, the step of partially removing the initial substrate is performed by mechanical-chemical thinning of said initial substrate until a second material thin film is obtained on the first material layer.

[0028] Advantageously, the step of growing said at least one layer on the first material layer is performed by molecular beam epitaxy (MBE) or by metal organic chemical vapour deposition (MOCVD), or by plasma enhanced chemical vapour deposition (PECVD). Other types of deposition can be performed (cathode sputtering, electron beam deposition, IBS (Ion Beam Sputtering), and so on).

[0029] The first material is advantageously AlAs, Si, etc.

[0030] The second material is advantageously GaAs, $\text{Si}_x\text{Ge}_{1-x}$, InP, Ge, and so on.

[0031] The receiving substrate is advantageously made of a material selected from silicon, glass and ceramic, or any other medium suitable for the intended use.

[0032] Advantageously, the at least one layer formed on the bonded first material layer is made of a material selected from GaAs, AlAs, Si, SiGe or SiO_2 , and so on. A III-V bilayer can thus be obtained.

[0033] The invention also makes it possible to obtain resonant cavity structures. The invention thus relates to a resonant cavity structure including an active layer, which transmits or detects light, interposed between two reflecting mirrors, wherein said structure is created using the method of production of the invention.

[0034] Advantageously, the two reflecting mirrors are Bragg mirrors obtained from thin films of which the materials are selected from Si_3N_4 , SiO_2 , TiO_2 , Si or HfO_2 .

[0035] The method for producing multilayers according to the invention has a number of advantages.

[0036] First, the step of evaporating the thin film and the step of growing the at least one layer on the first material layer are performed in the same epitaxy apparatus. The use of the same apparatus for these two steps limits the amount of equipment necessary, and therefore the costs. It minimises the handling and movement of plates, thus reducing the risks of damage.

[0037] The structure consisting of the receiving substrate, the first material film and the second material thin film can be considered to be "epi ready", in the sense that this structure does not require a chemical preparation of its surface before it is inserted into the epitaxy apparatus or reactor: the removal of the second material thin film is performed by a thermal step before the epitaxial growth step.

[0038] The surface of the first material layer on which the growth of at least one layer is performed is protected (because it is embedded) throughout the process. Therefore, it undergoes no physical or chemical change, which is favourable for the growth of high-quality multilayers.

[0039] Unlike the prior art, the first material layer, which corresponds to the barrier layer of the prior art, is not in contact with the air: it remains in a controlled atmosphere. Therefore it is not damaged. Thus, it is not necessary to remove it to grow the multilayers, and the method is consequently simplified.

[0040] The at least one layer formed on the bonded first material layer can be obtained regardless of the growth method used: it can be obtained by molecular beam epitaxial growth or by metal organic chemical vapour deposition (MOCVD) or by PECVD. The thickness of this layer (or these layers) is therefore perfectly controlled and, more generally, the thickness of the entire stack made from this layer. Indeed, no chemical etching or polishing step is performed, as these steps are by nature less precise than the epitaxy or deposition steps.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] The invention can be better understood, and special features will become apparent, in the reading of the following description, given as a non-limiting example, accompanied by the appended drawings in which:

[0042] FIGS. 1A to 1F show the steps of producing a multilayer on a substrate according to the invention,

[0043] FIGS. 2A to 2E show the steps of producing another multilayer on a substrate according to the invention,

[0044] FIGS. 3A to 3E show the steps of producing a multilayer including a Bragg mirror according to the invention,

[0045] FIGS. 4A to 4E show the steps of another example of the production of a multilayer including a Bragg mirror according to the invention.

[0046] It should be noted that the sizes of layers and substrates in these figures are not shown to scale.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

[0047] In a first embodiment, we will describe in detail the steps for producing a GaInP/GaAs/AlAs/GaAs/ Si_3N_4 / SiO_2 multilayer on a Si receiving substrate.

[0048] First, an initial substrate **1** is formed, comprising a supporting GaAs substrate **3** on which a first AlAs material layer **2** with a thickness of 100 nm is grown, for example by molecular beam epitaxy, then an additional GaAs layer **4** with a thickness of 150 nm is grown on the first material layer (FIG. 1A). The procedure for producing a layer of material having a predetermined thickness by means of